Mechanical Model of RF MEMS Capacitor Structure

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Introduction: Information concerning mechanical behavior of RF MEMS based capacitor is important during the design stage. A compensation layer to avoid unwanted particular total strain can be utilized. When the number of elements involved in equations during simulation is huge due to thin multilayers, an approach to reduce is useful, though accuracy is one aspect to be considered.

Design: The structure of RF MEMS capacitor consists of conductor plates separated by air gap and dielectric layers.

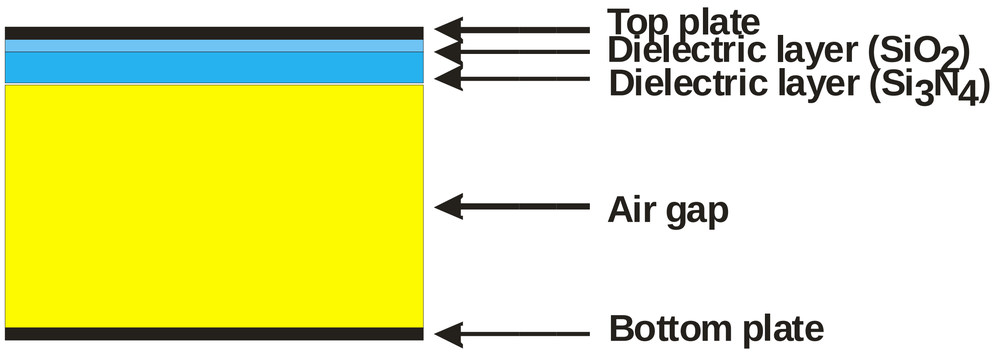

Figure 1. Cross section view of capacitor structure

Presented structures consist of membrane supported by different type of suspension.

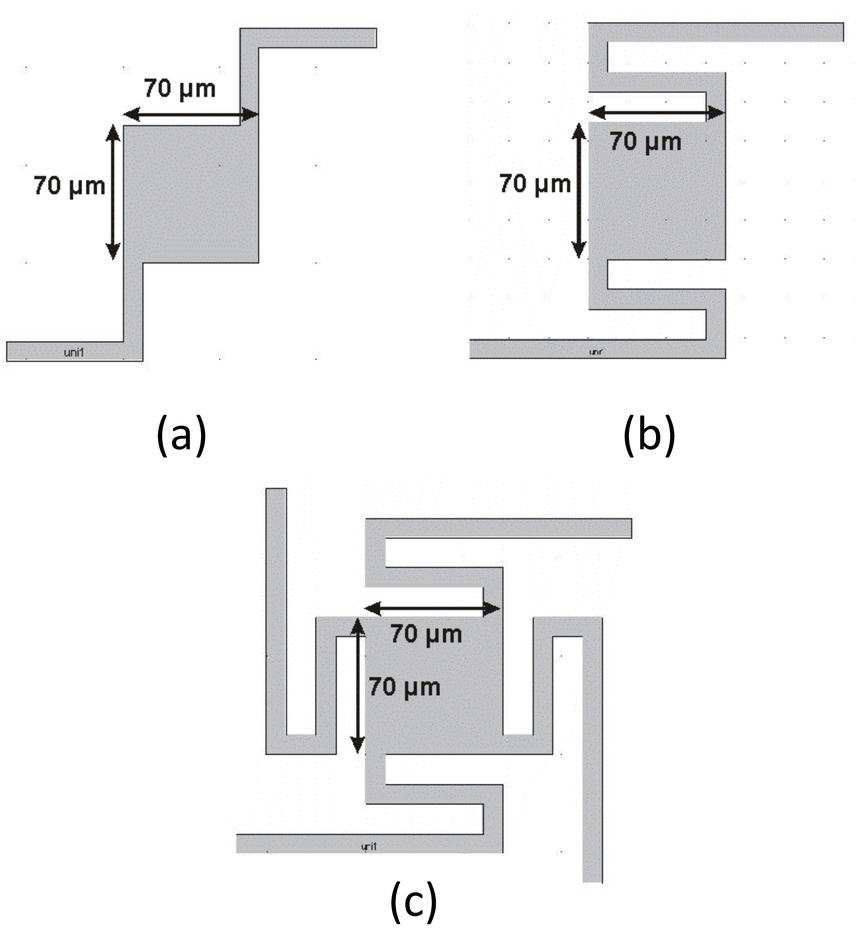

Figure 2. Top view of the structures

Results: The results obtained from the simulation work show tensile strain occurs on the structures as expected.

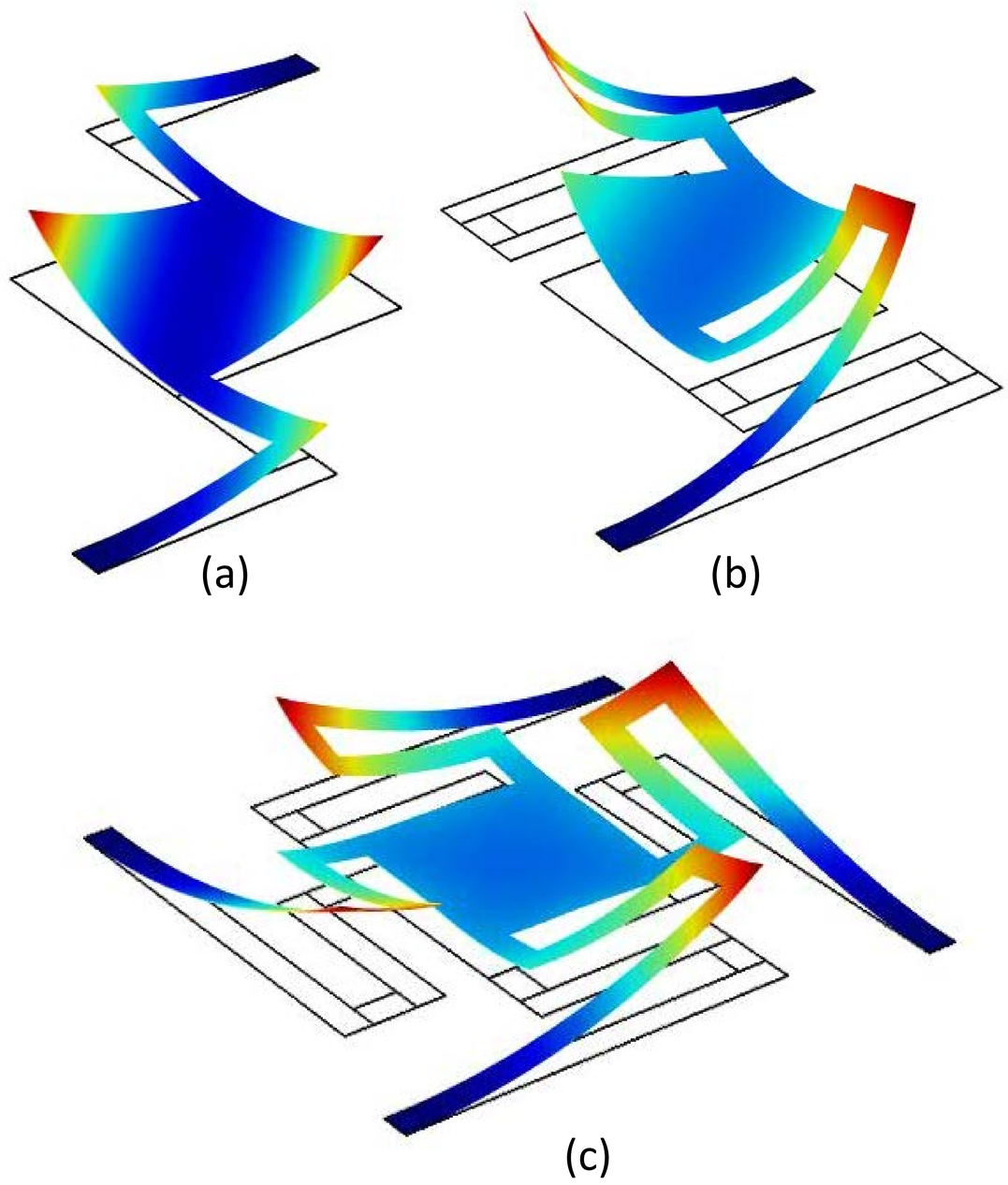

Figure 3. Simulation result for different structures

Conclusions: The compensation layer performs its task successfully as designed on purpose to allow removal of sacrificial layer. Considering effective area and distance between conductor plates, the structures show potential capacitor for particular applications.

References:

1. Kusserow et al., Tunable Fabry-Perot-filters based on InP/air-gap mirrors, Photonic International, 1, 14 (2009)
2. Vasu, Computational Analysis on Various Device Designs of Tunable Optical Filters using the FEM, University of Kassel (2004)
3. Song et al., Design and Analysis of a Novel Actuation Voltage Capacitive RF MEMS Switches, Proc. of the 3rd IEEE International Conference on Nano/Micro Engineered and Molecular Systems, 235 (2008)